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**DOE-STD-1107-97  
January 1997**

## **DOE STANDARD**



# **KNOWLEDGE, SKILLS, AND ABILITIES FOR KEY RADIATION PROTECTION POSITIONS AT DOE FACILITIES**



**U.S. Department of Energy  
Washington, D.C. 20585**

**FSC 6910**

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## FOREWORD

1. This Department of Energy standard is approved for use by all DOE Components and their contractors.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data that may improve this document should be sent to the Office of Worker Protection and Hazards Management (EH-52), U.S. Department of Energy, Washington, DC 20585, by letter or by using the self-addressed Document Improvement Proposal (DOE F 1300.3) appearing at the end of this document.

3. DOE technical standards, such as this standard, do not establish requirements. However, all or part of the provisions in a DOE standard can become requirements under the following circumstances:

- (1) they are explicitly stated to be requirements in a DOE requirements document; or
- (2) the organization makes a commitment to meet a standard in a contract or in an implementation plan or program plan required by a DOE requirements document.

Throughout this standard, the word "shall" is used to denote actions which must be performed if the objectives of this standard are to be met. If the provisions in this standard are made requirements through either of the two ways discussed above, then the "shall" statements would become requirements. It is not appropriate to consider that "should" statements would automatically be converted to "shall" statements as this action would violate the consensus process used to approve this standard.

4. In December 1991, the Defense Nuclear Facilities Safety Board recommended (DNFSB Recommendation 91-6) that the Department of Energy (DOE) review existing radiation protection training programs at its defense nuclear facilities and develop and implement a plan for an expanded training program at these facilities. Recommendation 91-6 also addressed DNFSB concerns regarding the need for qualification criteria for key radiation protection positions. DNFSB subsequently recommended (DNFSB Recommendations 92-7 and 93-3) that the qualifications of all technical contractor staff and Federal employees associated with defense

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nuclear facilities be improved. The DOE Implementation Plan for DNFSB Recommendation 93-3 was designed to act as an umbrella for previous recommendations in training and qualification, including Recommendation 92-7.

The following programs and directives respond to Recommendations 92-7, 93-3, and 91-6 as they relate to qualifications criteria for radiation protection personnel:

### Federal Employees

DOE Order 360.1, *Training*, became effective May 1995 and has as one of its objectives *to establish the requirements for the training and qualification of technical employees and managers whose position requires them to provide management direction or oversight that could impact the safe operation of a defense nuclear facility.* In implementing this order, DOE developed a *Technical Qualification Program*, which specifies base qualifications for all DOE defense nuclear facility technical personnel. This program requires that *Functional Area Qualification Standards* be developed for various technical disciplines. In March 1995 a functional area qualification standard for radiation protection personnel was issued. The *Radiation Protection Qualification Standard, Defense Nuclear Facilities Technical Personnel*, provides program implementation responsibilities, technical qualification standards, and expected competencies. The standard addresses all radiation protection positions associated with defense nuclear facilities. The DOE Federal personnel key radiation protection positions identified later in this Standard are enveloped under the *Technical Qualification Program* and the *Radiation Protection Qualification Standard*.

In select cases, it may be appropriate to augment an individual's competencies under the *Technical Qualifications Program*. This should be accomplished by adding the necessary information/competency into the individual's Office/facility specific qualification standard. Appendices B and D may be beneficial in providing guidance and example knowledges and skills for these individuals. Although these appendices are geared toward contractors, Federal personnel may use the information in order to identify sample knowledges and skills to augment an individual's Office/facility specific qualification standard.

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### Contractor Employees

DOE contractor qualifications for technical personnel are addressed by DOE Order 5480.20A, *Personnel Selection, Qualification, and Training Requirements For DOE Nuclear Facilities*; and 10 CFR 830.120, *Quality assurance requirements*.

DOE 5480.20A was revised in November 1994 to meet Implementation Plan commitments made in response to DNFSB Recommendation 93-3. This revision improves the quality and consistency of training and qualification requirements for technical professionals and management personnel of DOE contractors who operate defense nuclear facilities. DOE 5480.20A provides requirements for the administration of training programs and sets standards for the qualification of radiation protection personnel at defense nuclear facilities. The requirements are based on DOE, Nuclear Regulatory Commission (NRC), and related industry standards.

These programs provide the requirements to specify qualification criteria for radiation protection personnel. This document supplements the requirements discussed above by synthesizing qualification criteria from several source documents into a single reference. This document provides an acceptable basis for development of qualification criteria for contractor key radiation protection positions by describing the level of knowledge, skills, and abilities for key radiation protection positions at DOE radiological facilities. Qualification criteria for personnel in key radiation protection positions are provided in the appendices to this document. Appendix A provides general and specific qualification criteria for contractor key radiation protection positions. Appendix B lists knowledge, skills, and abilities for key radiation protection positions and contains a sample contractor radiological control manager position description format. Appendix C discusses indicators that can be used to develop performance measurement criteria for contractor and DOE federal key radiation protection positions.

Appendix D is a compilation of generic descriptions of work and associated knowledge and skills for health physics categories of work. The appendix comprises a document which was developed separately from DOE's responses to the DNFSB recommendations concerning training and qualifications of key radiation protection personnel. This appendix provides important additional guidance for developing training and qualifications for key radiation protection positions. This appendix provides examples from which specific knowledge, skills,

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and abilities can be identified for contractor and DOE federal key radiation protection positions. Although this appendix identifies management and supervisory skills for health physics positions, the technical qualification criteria developed for each key position need not include these skills. Management development and training programs should be relied upon to provide incumbents in key positions with the requisite managerial and supervisory skills.

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## 1. SCOPE

### 1.1 Purpose

This document provides detailed qualification criteria for contractor key radiation protection personnel. Although federal key radiation protection positions are also identified in Table 1, qualification standards for federal positions are provided in DOE O 360.1 and the DOE *Technical Qualifications Program*. Appendices B and D provide detailed listings for knowledge, skills, and abilities for contractor and DOE federal key radiation protection positions. This information may be used in developing position descriptions and individual development plans. Information provided in Appendix C may be useful in developing performance measures and assessing an individual's performance in his or her specific position. Additionally, Federal personnel may use this information to augment their Office/facility qualification standards under the *Technical Qualifications Program*.

Note: The definition of a "key radiation protection position" is: DOE and contractor personnel specifically designated by their organization to exercise discretionary authority and/or make independent judgements and decisions beyond those covered by established procedures concerning radiation protection issues associated with the design, construction, operation and maintenance, or decommissioning of defense nuclear facilities.

These positions include one or more of the following functions:

- o DOE personnel specifically designated to develop, review, or approve DOE orders, regulations, and other radiation protection requirements relating to the design, construction, operation and maintenance, or decommissioning of defense nuclear facilities.
- o DOE and contractor personnel specifically designated to develop, review, select, or approve radiation protection guidance to implement orders, regulations, and other requirements relating to the design, construction,

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operation and maintenance, or decommissioning of defense nuclear facilities.

- o DOE and contractor personnel specifically designated to translate radiation protection orders, regulation, and other requirements into programs, plans, procedures, and safety documentation relating to the design, construction, operation and maintenance, or decommissioning of defense nuclear facilities. Examples include personnel specifically designated to:
  - Develop, review, and/or approve implementation plans or the equivalent;
  - Develop, review, and/or approve implementing procedures;
  - Develop, review, and/or approve specific program documents in accordance with the direction provided by radiation protection orders, regulations and other requirements;
  - Develop and/or approve training materials. and
  - Develop, review, and/or approve training materials.
- o DOE or contractor personnel specifically designated to select and conduct the technical aspects of radiation protection programs. Examples include personnel specifically designated to:
  - Develop the criteria to select, review, test, calibrate, and/or approve the purchase of radiation detection, measurement or worker protection equipment;
  - Develop, review, conduct, and/or approve the external and internal dosimetry program, including the selection of algorithms and models to determine worker radiation dose; and

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- Interpret radiation survey and monitoring data for the determination of monitoring and appropriate worker protection equipment and consideration of other work controls to protect the worker and ensure personnel exposure and releases of material or effluent are maintained as low as reasonable achievable.
- o DOE and contractor personnel specifically designated to conduct assessment of the implementation of radiation protection orders, regulations and other maintenance, or decommissioning of defense nuclear facilities.

### **1.2 Applicability**

This standard applies to all DOE Headquarters and field organizations, management and operating contractors, and laboratories (hereinafter referred to collectively as "DOE components") working to the requirements of 10 CFR 835, "Occupational Radiation Protection."

### **1.3 References**

- 1.3.1 DNFSB Recommendation 91-6 Implementation Plan
- 1.3.2 DNFSB Recommendation 92-7 Implementation Plan
- 1.3.3 DNFSB Recommendation 93-3 Implementation Plan
- 1.3.4 DOE Order 360.1, "Training"
- 1.3.5 "Technical Qualification Program"
- 1.3.6 "Radiation Protection Qualification Standard, Defense Nuclear Facilities Technical Personnel"
- 1.3.7 DOE Order 5480.20A, "Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities"
- 1.3.8 10 CFR 830.120, "Quality assurance requirements"
- 1.3.9 10 CFR 835, "Occupational Radiation Protection"
- 1.3.10 ANSI/ANS-3.1-1993, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants"
- 1.3.11 DOE/EH-0256T, Rev. 1, "DOE Radiological Control Manual"

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## 2. PROGRAM RESPONSIBILITIES

### 2.1 Developing Qualification Criteria

Each DOE component should identify key radiation protection positions at their facilities. Once these positions are identified, detailed knowledge, skills, abilities, and other qualifications should be developed and incorporated into appropriate position descriptions. A sample position description format for a radiological control manager of a generic facility is provided in Appendix B. Other position descriptions can be patterned after this example. Appendix D provides a detailed listing of knowledges and skills pertinent to radiation protection positions and may be useful in developing appropriate qualification criteria.

- 2.1.1 Each DOE component should compare the level of knowledge, skills, and abilities of incumbents in key radiation protection positions to the qualification criteria identified in this standard. For Federal positions, qualification criteria are contained in the *Technical Qualifications Program*.

Note: In some instances, this criteria exceeds the requirements of DOE Order 5480.20A and should be considered as guidance that may be used as part of an effort to achieve excellence.

Note: In select cases, it may be appropriate to augment an individual's competencies under the *Technical Qualifications Program*. This should be accomplished by adding the necessary information/competency into the individual's Office/facility specific qualification standard. Appendices B and D may be beneficial in providing guidance and also in providing example knowledges and skills for these individuals. Although these appendices are intended for contractors, Federal personnel may find this information useful as examples of knowledges and skills which can augment an individual's Office/facility specific qualification standard.

- 2.1.2 In cases where an incumbent does not meet the level of knowledge, skills, and abilities appropriate for their position, they may be reassigned to another position

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or be given supplemental training to ensure that the employee develops the level of knowledge, skills, and abilities necessary for the position.

- 2.1.3 Where the supplemental training option is chosen by management, the affected incumbent and an appropriate level of management should work together to identify the training necessary to upgrade the level of knowledge, skills, and abilities. The identified supplemental training specifications, including a schedule for completion, should be provided to the incumbent's direct supervisor for incorporation into each incumbent's development plan or similar program.
- 2.1.4 Where appropriate, the need for interim measures to compensate for deficiencies in an incumbent's qualifications or training shall be identified and implemented by management.
- 2.1.5 Appropriate documentation such as that provided by course directors for successful completion of supplemental training should be retained in the incumbents personnel file. The incumbent's knowledge, skills, and abilities may be evaluated through appropriate written, oral, or practical examination at the conclusion of each supplemental training course to ensure that the course content is valid and effective for reaching the requisite level of knowledge, skills, and abilities.
- 2.1.6 The impact of the training on the individual's performance should be evaluated during the ongoing performance management process discussed later in this standard.
- 2.1.7 Training needs of a generic nature identified during qualification comparisons should be forwarded to the DOE Office of Worker Protection Programs and Hazards Management (EH-52). These supplemental training needs will be analyzed to identify the need for new standardized training courses. The availability of commercial courses will be considered in this determination.

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### 2.2 Performance Measurement and Evaluation

2.2.1 Performance criteria should be mutually identified by management and individuals in key radiation protection positions. Setting personal goals and objectives consistent with organizational goals and objectives is critical to achieving excellence in radiological control programs and should be documented in individual development plans or similar program.

2.2.2 Individual performance for key radiation protection positions shall be evaluated to ensure that individual performance is meeting performance standards included in individual development plans or in a similar program.

2.2.3 Individual performance standards should be used to provide timely feedback to management and employees on progress toward achieving individual performance goals and objectives.

Note: A series of radiological performance indicators are contained in the *DOE Radiological Control Manual* which may be used to set organizational goals and objectives. These indicators may be used to develop measurable milestones to monitor the performance of individuals in key positions. In addition to the performance indicators listed in the *DOE Radiological Control Manual*, the Department has identified data in the Occurrence Reporting and Processing System (ORPS) which may also be useful in developing appropriate radiological performance standards. The *DOE Radiological Control Manual* indicators are provided in Appendix C.

2.2.4 In addition to performance standards, personnel performance evaluations should be conducted as a routine management function, providing employees with feedback regarding how effectively they are performing their jobs.

2.2.5 Performance evaluations should be used to provide both management and employees the opportunity to identify and correct performance problems.

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- 2.2.6 Measurable goals and objectives should be established to facilitate performance evaluations by managers and gauging the performance of their staff. Employees can use these measures to monitor their performance and make adjustments to correct adverse trends.

Note: The performance indicators in the *DOE Radiological Control Manual* can be useful in developing individual performance goals and objectives.

- 2.2.7 Each manager of a key radiation protection position should work with the incumbent to identify appropriate performance standards for that position. These performance standards should be agreed to by both management and employees, reviewed periodically to verify progress toward meeting the stated goals and objectives, and modified to reflect changes in specific situations.

### 3. Site Responsibilities

Sites implementing the guidelines of this standard should review the facility specific training matrix required by DOE 5480.20A. The matrix describes the specific training required to operate the facility and notes deviations or exemptions from applicable requirements. The matrix is an agreement between the DOE Operations Office and the contractor that defines the basis for the facility radiological operations and provides the facility training requirements.



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**Table I.**  
**Key Radiation Protection Positions**

DOE OPERATIONS OFFICES	CONTRACTOR
<ul style="list-style-type: none"> <li>• Radiological Control Program Advisor or equivalent</li> <li>• Radiation Protection Branch Chief and/or Office Director</li> <li>• Radiation Safety Officer</li> <li>• Health Physicist</li> <li>• Nuclear Engineers with radiological protection responsibilities</li> <li>• Physical Scientists with radiological protection responsibilities</li> <li>• Environmental Engineers/Scientists with radiological protection responsibilities</li> <li>• Contractors who provide health physics, radiological protection or control technical support</li> <li>• Emergency response personnel with radiological protection or control responsibilities</li> <li>• Instructors for radiological protection or control training</li> <li>• Supervisors for the above positions</li> </ul>	<ul style="list-style-type: none"> <li>• Health Physicist</li> <li>• Radiological Control Manager</li> <li>• Radiological Operations Manager</li> <li>• Radiological Health Manager</li> <li>• Radiological Engineering Manager</li> <li>• Radiological Building Engineering Manager</li> <li>• Radiological Building Engineer</li> <li>• Dosimetry Manager (Internal and External)</li> <li>• Dosimetrist (Internal and External)</li> <li>• Radiological Instrument Manager</li> <li>• Radiological Operations Section Manager</li> <li>• Radiological Operations Foreman</li> <li>• Radiological Engineering Health Physicist</li> <li>• Radiological Compliance Manager</li> <li>• Radiological Assessment Manager</li> <li>• Radiological Design Supervisor</li> <li>• Senior Radiological Control Technician</li> <li>• Radiological Control Technician Supervisor</li> <li>• Regulatory Compliance Manager</li> <li>• Emergency response personnel responsible for radiation protection or radiological control</li> <li>• Radiation Protection/Radiological Control Instructors</li> <li>• ALARA Planning Manager</li> <li>• Supervisors for the above positions (except Radiological Control Manager)</li> </ul>
HEADQUARTERS	
<ul style="list-style-type: none"> <li>• Radiological Control Program Advisor</li> <li>• Health Physicist</li> <li>• Health and Safety Managers with radiological protection or control responsibilities</li> <li>• Nuclear Engineers with radiological protection or control responsibilities</li> <li>• Physical Scientists with radiological protection or control responsibilities</li> <li>• Environmental Engineers/Specialists with radiological protection or control responsibilities</li> <li>• Emergency response personnel with radiological protection or control policy, planning or contractor plan approval responsibilities</li> <li>• Subject matter experts and instructors for radiological protection or control training courses</li> <li>• Supervisors for the above positions</li> </ul>	

Note: Although these appendices are intended for contractors, Federal personnel may find this information useful as examples of knowledges and skills which can augment an individual's Office/facility specific qualification standard.

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**Appendix A**

**Qualification Criteria for Contractor Key Radiation Protection Positions**

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## Appendix A

### Qualification Criteria for DOE Contractor Key Radiation Protection Positions

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## Appendix A

### Qualification Criteria for DOE Contractor Key Radiation Protection Positions

#### Introduction

The criteria in this appendix have been divided into General and Specific Qualification Criteria for DOE radiological facility key radiation protection positions. Due to similarities in the basic training and qualifications for the contractor key radiation protection positions, six generic positions have been identified and are discussed throughout this appendix. Table A-1 provides a listing of the six generic key radiation protection positions, cross-referencing them with specific key radiation protection positions. The General Criteria provide explanatory material for the Specific Criteria identified for each of the six generic positions. In the text, the Specific Qualification Criteria for key radiation protection positions follow the General Qualification Criteria.

It should be noted that this criteria is equivalent to or exceeds the requirements of DOE Order 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities* and ANSI/ANS-3.1-1993, *Selection, Qualification, and Training of Personnel for Nuclear Power Plants*. DOE 5480.20A provides a graded approach to qualification criteria that considers the hazard inherent to the facility and the level of responsibility associated with the key radiation protection position. This document used the highest standards from DOE 5480.20A and ANSI/ANS-3.1 to provide guidance in the development of qualification criteria. This standard supplements the requirements contained in DOE O 360.1, *Training*, and the DOE *Technical Qualifications* program.

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**TABLE A-1 - POSITION MATRIX**

<b>Key Radiation Protection Positions</b>	Radiological Control Manager	Radiological Control Senior/ Technical and Support Staff	Radiological Control Technician Supervisor	Senior Radiological Control Technician	Radiological Assessor	Radiological Control Instructor
Health Physicist		x				
Radiological Control Manager	x					
Radiological Operations Manager		x				
Radiological Health Manager		x				
Radiological Engineering Manager		x				
Radiological Building Engineering Manager		x				
Radiological Building Engineer		x				
Dosimetry Manager (Internal and External)		x				
Dosimetrist (Internal and External)		x				
Radiological Instrument Manager		x				
Radiological Operations Section Manager		x				
Radiological Operations Foreman			x			
Radiological Engineering Health Physicist		x				
Radiological Compliance Manager					x	
Radiological Assessment Manager					x	
Radiological Design Supervisor		x				
Radiological Control Technician Supervisor			x			
Regulatory Compliance Manager					x	

<b>Key Radiation Protection Positions</b>	Radiological Control Manager	Radiological Control Senior/ Technical and Support Staff	Radiological Control Technician Supervisor	Senior Radiological Control Technician	Radiological Assessor	Radiological Control Instructor
Emergency response personnel responsible for radiological protection or control	x	x	x	x		
Radiation Protection/Radiological Control Instructors						x
ALARA Planning Manager		x				
The above positions supervisors (except RadCon Manager)		x	x			

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GENERAL QUALIFICATION CRITERIA [adapted from ANSI/ANS-3.1-1993, *Selection, Qualification, and Training of Personnel for Nuclear Power Plants*, section 4.1 and DOE 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*]

The level of knowledge, skills, and abilities forms the basis for qualification requirements for key radiation protection positions at DOE radiological facilities. Radiological control personnel should possess the knowledge, skills, and abilities commensurate with their organization position and the responsibilities of that position (10 CFR 830.120(c)(ii), *Personnel Training and Qualification*). An acceptable set of qualifications for key radiation protection positions are provided in this appendix. Qualification is defined in terms of education, experience, training examination, and any special requirements necessary for performance of assigned responsibilities. Individuals should be qualified at the time of appointment to the position.

#### A. *Basic Qualification Criteria*

In the case of individuals who do not fully meet the literal requirements for a given key radiation protection position, consideration may be given to the collective experience of the operating organization. Individuals who do not meet the experience requirements for a position may be assigned to that position provided the overall operating organization is considered balanced and strong and that DOE approval is obtained on a case-by-case basis. Individuals temporarily filling a position due to the absence of its principal should possess, as a minimum, the qualifications required for the corresponding position in the next lower functional level. Such assignments should be justified and a time period for them specified and documented. Temporary assignments should not reduce the collective experience requirements specified for that level. Individuals filling positions having special requirements stated in this document should meet those special requirements.

Time spent in a structured, job-related development program may be considered experience meeting the requirements discussed in this appendix if the individual performs tasks or observes and discusses the performance of tasks similar to those that the individual will be qualified to perform. The structured program should involve observation and performance of a variety of tasks that cover the range of duties of the qualified position. The individual should perform the tasks under the direction of a qualified individual. To

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the extent possible, the structured program should contain hands-on experience that is directly applicable to the job.

Experience requirements described in this appendix may be earned concurrently with other experience. Where certification is specified in this appendix, it should be done by an individual responsible for the performance area.

### **1.1 Education**

Educational criteria are defined as baccalaureate, associate's degree, or high school diploma. The successful completion of these educational programs should be determined by a transcript or other documentation from an accredited institution. Where an academic degree is specified, the type of degree should support the individual's functional responsibility in the organization.

#### **1.1.1 Alternatives to Degree Requirements**

Individuals who do not possess the formal educational requirements specified in this section should not be automatically eliminated if other factors sufficiently demonstrate their abilities to fulfill the duties of a specific key radiation protection position. These factors should be evaluated on a case-by-case basis and approved and demonstrated by management.

The following are examples of acceptable alternatives to educational requirements:

- (1) High School Diploma
  - (a) General Educational Development (GED) Test

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#### (2) Associate's Degree

- (a) Successful completion of 43 semester credit hours of the technical portions of an engineering, engineering technology, or related science program may be substituted for the associate's degree. The courses should be in appropriate technical subjects relevant to the key radiation protection position to be filled; or
- (b) High school diploma plus completion of a job-specific performance-based training program plus 1 additional year of related experience.

#### (3) Baccalaureate

- (a) Professional Engineer's License; or
- (b) Successful completion of Engineer in Training (EIT) examination; or
- (c) American Board of Health Physics Certification; or
- (d) Successful completion of one part of the American Board of Health Physics certification examination; or
- (e) Successful completion of 80 semester credit hours of the technical portions of an engineering, engineering technology, or related science program may be substituted for the baccalaureate. The courses should be in appropriate technical subjects relevant to the key radiation protection position to be filled.

#### 1.1.2 Experience Substitution for Education

Related experience may be substituted for education at the rate of 6 semester credit hours for each year of experience up to a maximum of 60 hours of credit.

#### 1.2 Experience

Experience requirements for key radiation protection positions are expressed in terms of time worked in DOE nuclear facilities or in a technical job function related to DOE radiological activities. Experience outside the DOE complex may be considered on a case-by-case basis provided the types of radiological activities are similar to those encountered in the key radiation protection position.

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#### **1.2.1 Alternatives to Experience**

Alternatives to (or exemptions from) experience requirements may be allowed based on a case-by-case evaluation of the position requirements and the experience that the alternative(s) provide. Alternatives to experience should be allowed if the alternate experience was acquired by performing duties similar to those for which the individual seeks qualification. Time spent in training is not considered applicable experience except as discussed below.

#### **1.2.2 Related Experience**

Where course work is related to job assignments, post-secondary education may be substituted for related experience at a ratio of 2 years of education for 1 year of experience. Total credit for post-secondary education should not exceed 2 years.

#### **1.3 Special Requirements**

This appendix addresses a preference for American Board of Health Physics certification and National Registry of Radiation Protection Technologists registration for certain positions. Individuals filling key radiation protection positions should be encouraged to attain these certifications, but should not be excluded if certification or registration is not attained.

#### **1.4 Training**

The Department has promulgated standardized training programs for general employees, radiological workers, and radiological control technicians. Radiological control technicians and their direct supervisors should be qualified in accordance with the standardized training for radiological control technicians. The training needs for other key radiation protection positions may be identified and included in the individual development plans or in a similar program.

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### B. *Supervisory Qualification Criteria*

Individuals in management and supervisory key radiation protection positions have responsibility for providing the decisions to assess and control radiological activities to ensure worker health and safety is effectively protected. Managers provide coordination and direction for their functional area and provide coordination among other groups within the contractor, DOE Headquarters, or field office organization. Managers and supervisors typically develop and administer the radiological control program and policies. They also support implementation of these programs and policies. Supervisory duties include ensuring work is performed in compliance with procedures, policies, and industrial safety practices.

#### 1.1 Management and Supervisory Abilities

The following list describes acceptable abilities for management and supervisory key radiation protection positions:

1.1.1 Ability to develop and implement strategic and tactical plans for the administration of a complex radiological protection program; and

1.1.2 Ability to identify areas where policy direction is needed, and then promulgate policy in all areas of radiological protection.

1.1.3 Ability to communicate with and motivate personnel.

#### 1.2 Management or Supervisory Skills

Managers and supervisors should have prior training or experience in supervision or management. Training for supervisors should develop their skills in the following areas:

1.2.1 Management responsibilities;

1.2.2 Problem analysis and decision making;

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1.2.3 Administrative policies and procedures; and

1.2.4 Interpersonal skills.

#### SPECIFIC QUALIFICATION CRITERIA

Qualification criteria for the following six generic radiation protection positions are included in Appendix A: Radiological Control Manager; Radiological Control Senior/Technical and Support Staff; Radiological Control Technician Supervisor; Senior Radiological Control Technician; Radiological Assessor; and Radiological Control Instructor. Most of these positions are referenced in the *DOE Radiological Control Manual*; however, the assessor and instructor positions are not specifically described. These two positions are necessary to implement the guidance of the *DOE Radiological Control Manual* and are directly related to specific key radiation protection positions identified by the Department.

Qualification criteria adapted from the *DOE Radiological Control Manual* appear as references in brackets with the appropriate article number cited (e.g., [RCM 642.1]); those adapted from ANSI/ANS-3.1-1993, *Selection, Qualification, and Training of Personnel for Nuclear Power Plants*, appear as references in brackets with the appropriate section number from the ANSI standard (e.g., [ANSI/ANS-3.1, 4.4.4]); those adapted from DOE 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, appear as references in brackets (e.g., [DOE 5480.20A, Chap. II]).



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## **Appendix A**

### ***RADIOLOGICAL CONTROL MANAGER***

Radiological Control Manager

Emergency response personnel

### ***POSITION SPECIFICATION***

The Radiological Control Manager should be an experienced professional in radiological control and be familiar with the design features and operations of the facility that affect the potential for exposures of persons to radiation. [RCM 142.1]

The Radiological Control Manager should have the technical competence and experience to establish radiological control programs and the supervisory capability to direct the implementation and maintenance of radiological control programs. [RCM 142.2]

The Radiological Control Manager should have knowledge of Federal, State, and local regulations and requirements, and of national and international radiation protection standards and recommendations.

The Radiological Control Manager should have knowledge of techniques in the development of comprehensive radiation protection programs for a large industrial/nuclear complex.

### ***QUALIFICATION REQUIREMENTS***

#### **Education:**

Baccalaureate in science, health physics, or engineering. [DOE 5480.20A, Chap. II and ANSI/ANS 3.1, 4.3.3]

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### Appendix A

**Acceptable experience for the position** [ANSI/ANS 3.1, 4.3.3]:

Related experience	4 yr
which should include	
DOE radiological activities	3 yr
Supervisory or Management	1 yr
On-site	½ yr

#### Notes:

- (1) Certification by the American Board of Health Physics provides equivalency to the related experience and education required above. [RCM 142.3]
- (2) Advanced academic degrees can count as related experience where course work related to radiological control is involved. [RCM 142.3]

#### Special Requirements:

- (1) Management and supervisory skills described in section B of the General Qualification Criteria, paragraph 1.2, of this appendix. [ANSI/ANS 3.1, 4.3.3]
- (2) During the years of DOE radiological activities experience, the individual should have participated in supervision or management activities associated with DOE radiological activities for 3 months.
- (3) Management should provide persons assigned to or being considered for the position of Radiological Control Manager a structured program leading to certification by the American Board of Health Physics. [RCM 142.5]

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### Appendix A

#### *RADIOLOGICAL CONTROL SENIOR, TECHNICAL, AND SUPPORT STAFF*

Health Physicist	Radiological Operations Manager	Radiological Health Manager
Radiological Engineering Manager	Radiological Building Engineering (RBE) Manager	Radiological Building Engineer (RBE)
Dosimetry Manager (Internal and External)	Dosimetrist (Internal and External)	Radiological Instrument Manager
Radiological Operations Section Manager	Radiological Engineering Health Physicist	Radiological Design Supervisor
Emergency response personnel	ALARA Planning Manager	

#### ***POSITION SPECIFICATION***

Radiological Control Senior and Technical staff function as managers and supervisors and provide technical expertise. Radiological support personnel perform health physics and radiological engineering, dosimetry, bioassay, independent oversight, instrumentation, and calibration functions. These personnel should have technical qualifications pertinent to their assigned duties. [RCM 143.2]

#### ***QUALIFICATION REQUIREMENTS***

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### Appendix A

#### Education:

Baccalaureate in science, health physics, or engineering. This should include formal training in radiation protection. [DOE 5480.20A, Chap. II and ANSI/ANS 3.1, 4.3.3]

#### Acceptable experience for the position [DOE 5480.20A, Chap II]:

Related experience	4 yr
which should include	
DOE radiological activities	3 yr
On-site	½ yr

#### Notes:

- (1) Certification by the American Board of Health Physics provides equivalency to the related experience and education required above. [RCM 142.3]
- (2) Advanced academic degrees can count as related experience where course work related to radiological control is involved. [RCM 142.3]

#### Special Requirements:

- (1) During the 3 years of experience with DOE radiological activities, the individual should have participated in radiological control organization activities for 6 months.
- (2) A continuing training program should be established. Pursuit of American Board of Health Physics certification for senior and professional staff members is encouraged. [RCM 143.1]

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### Appendix A

#### *RADIOLOGICAL CONTROL TECHNICIAN SUPERVISOR*

Radiological Operations Foreman	Radiological Control Technician Supervisor	Emergency response personnel
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#### ***POSITION SPECIFICATION***

The Radiological Control Technician Supervisor is responsible for supervision of radiological protection monitoring and control activities. [DOE 5480.20A, Chap. II and ANSI/ANS 3.1, 4.4.6]

#### ***QUALIFICATION REQUIREMENTS***

##### **Education:**

High school diploma. [ANSI/ANS 3.1, 4.4.6]

##### **Acceptable experience for the position [ANSI/ANS 3.1, 4.4.6]:**

Related experience	3 yr
which should include	
DOE radiological activities	2 yr
On-site	¼ yr

##### **Notes:**

- (1) Registration under the National Registry of Radiation Protection Technologists provides equivalency to the related experience and education required above. [RCM 642.5]

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### Appendix A

#### Special Requirements:

- (1) During the 2 years of DOE radiological activities experience, the individual should have participated in radiological control organization activities at a DOE facility for 6 months.
- (2) Radiological Control Technician Supervisors should have qualified as Senior Radiological Control Technicians and should participate in continuing radiological training programs. [RCM 644.1]
- (3) Radiological Control Technician Supervisors should have supervisory and leadership capabilities to direct the work of technicians; effectively interact with crafts, line supervisors, professional staff and other managers; and be able to respond to and direct others in emergency and abnormal situations. [RCM 644.2]
- (4) Radiological Control Technician Supervisors should be requalified every 2 years through comprehensive Oral Examination Boards in accordance with RCM article 615. [RCM 644.3]
- (5) Oral Examination Boards should focus on the ability to analyze situations and supervise subordinates. The Radiological Control Technician Supervisor's depth of knowledge should exceed that expected of a Senior Radiological Control Technician. [RCM 644.4] *SENIOR RADIOLOGICAL CONTROL TECHNICIAN*

Senior Radiological Control Technician

Emergency response personnel

#### **POSITION SPECIFICATION**

Senior Radiological Control Technicians are responsible for monitoring radiological work, prescribing radiological controls for various radiological activities, and conducting radiological surveys. Technicians interpret and verify field data accumulated from radiological surveys and monitoring. [ANSI/ANS 3.1, 4.5.3]

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### Appendix A

#### **QUALIFICATION REQUIREMENTS**

##### **Education:**

High school diploma [DOE 5480.20A, Chap. II and ANSI/ANS 3.1, 4.5.3.2]

##### **Acceptable experience for the position** [DOE 5480.20A, Chap. II and ANSI/ANS 3.1]:

Related experience	3 yr
which should include	
DOE radiological activities	1 yr
On-site	¼ yr

##### **Notes:**

- (1) Registration under the National Registry of Radiation Protection Technologists provides equivalency to the related experience and education required above. [RCM 642.5]

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### **Appendix A**

#### **Special Requirements:**

- (1) Senior Radiological Control Technician qualification consists of the standardized core course training material, on-the-job training per these Qualification Criteria, and passing both a final comprehensive written examination and final Oral Examination Board. [RCM 642.1]
- (2) Senior Radiological Control Technicians should be trained using the standardized core course training materials and, in addition, should emphasize site-specific information. [RCM 642.2]
- (3) Senior Radiological Control Technician candidates who have prerequisite knowledge, such as college credit, operational experience, or related qualifications, may satisfy individual sections of the standardized core course training requirements by passing comprehensive challenge examinations. [RCM 642.3]
- (4) Senior Radiological Control Technicians should meet the physical requirements to handle personal protective equipment and other equipment and should assist others in work locations, commensurate with their assignments. [RCM 642.4]
- (5) Senior Radiological Control Technicians are encouraged to pursue registration by the National Registry of Radiation Protection Technologists (NRRPT). [RCM 642.5]



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### Appendix A

#### *RADIOLOGICAL ASSESSOR*

Radiological Compliance  
Manager

Radiological Assessment  
Manager

Regulatory Compliance  
Manager

#### ***POSITION SPECIFICATION***

The Radiological Assessor is the individual responsible for independently evaluating the effectiveness of implementing the contractor radiological control program, as well as compliance with policies and procedures.

#### ***QUALIFICATION REQUIREMENTS***

##### **Education:**

Baccalaureate in engineering or related science, including formal training in radiation protection.  
[DOE 5480.20A, Chap II and ANSI/ANS 3.1, 4.3.7]

**Acceptable experience for the position** [DOE 5480.20A, Chap. II and ANSI/ANS 3.1, 4.3.7]:

Related experience	4 yr
which should include	
DOE radiological activities	3 yr
Supervisory or Management	1 yr

##### **Special Requirements:**

- (1) These personnel should have the management and supervisory skills described in section B, paragraph 1.2, of this appendix. [ANSI/ANS 3.1, 4.3.7]
- (2) These personnel should have 1 year of experience performing quality verification activities in radiological controls. [ANSI/ANS 3.1, 4.3.7]

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### **Appendix A**

- (3) These personnel should possess knowledge of radiological protection programs sufficient to review plans and procedures pertaining to radiological protection.
- (4) Radiological assessment personnel should have technical knowledge sufficient to provide independent oversight of health physics, radiological engineering, dosimetry, bioassay, instrumentation, and calibration functions.

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### Appendix A

#### *RADIOLOGICAL CONTROL INSTRUCTOR*

Radiation Protection Instructor

Radiological Control Instructor

#### ***POSITION SPECIFICATION***

Radiological control instructors are responsible for instructing individuals in radiation protection/radiological control.

#### ***QUALIFICATION REQUIREMENTS***

##### **Education:**

High school diploma. [DOE 5480.20A, Chap. II and ANSI/ANS 3.1, 4.5.4]

**Acceptable experience for the position** [DOE 5480.20A, Chap. II and ANSI/ANS 3.1, 4.5.4]:

Related experience: 2 yr

which should include

DOE radiological activities ¼ yr

##### **Special Requirements:**

- (1) These personnel should have demonstrated knowledge of instructional techniques through training or experience and be certified as a qualified instructor for the material being presented. [ANSI/ANS 3.1, 4.5.4]
- (2) All instructors should be qualified in accordance with the contractor's site Instructor Qualification Program or possess equivalent qualifications. [RCM 616.1]
- (3) Instructors should have the technical knowledge, experience, and instructional skills required to fulfill their assigned duties. [DOE 5480.20A, Chap. II and RCM 616.2]

## **DOE-STD-1107-97**

### **Appendix A**

- (4) Instructors-in-training should be monitored by a qualified instructor. [RCM 616.3]
  
- (5) Subject matter experts without instructor qualification may provide training in their areas of expertise. However, these subject matter experts should be trained as instructors when this occurs routinely.  
[RCM 616.4]

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**Appendix B**

**Detailed Examples of Knowledge and Skills**

**and**

**Sample Radiological Control Manager**

**Detailed Position Description Format**

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**Appendix B**

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## **Appendix B**

### **Detailed Examples of Knowledge and Skills**

#### **Knowledge Levels for the Performance of Radiation Protection Functions**

##### **Radiological Protection Standards, Regulations, and Requirements**

International Commission on Radiological Units and Measurements (ICRU) reports

Institute for Nuclear Power Operations (INPO) guidelines

American National Standards Institute (ANSI) standards

National Commission for Radiation Protection (NCRP) reports

International Commission for Radiation Protection (ICRP) publications

Department of Energy (DOE) regulations

DOE limits

Title 10 Code of Federal Regulations Part 835 (10 CFR 835), Occupational Radiation Protection; Final Rule

DOE Orders

DOE Radiological Control Manual

Radioactive waste management requirements

##### **Non-Radiological Standards, Regulations, and Requirements**

Conduct/formality of operations

Quality Assurance/Quality Control (QA/QC) techniques

Occurrence reporting, requirements and procedures

Facility design

Facility, site, and processes

Contractor organization and administration

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## **Appendix B**

### Contamination Control

Release criteria for materials/equipment

Surface contamination levels

Protective clothing and equipment

Potential sources of airborne contamination

Confinement systems



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## **Appendix B**

### **Knowledge Levels for the Performance of Radiation Protection Functions (continued)**

#### **Instrumentation, Surveys, and Monitoring**

- Instrumentation

- Instrumentation calibration

- Surveying techniques

- Radiation monitoring (alpha, beta/gamma, neutron, radon, radon progeny)

- Monitoring systems

- Detection and alarm systems

- Air sampling methods

- Surveillance techniques

#### **Personnel Exposure Control**

- As Low As Reasonably Achievable (ALARA) programs

- Control of external exposure (time, distance, shielding, quantity)

- Control of internal exposure (time, respiratory protection, quantity)

- Access control techniques

- Radiation producing machines

- Confinement systems

#### **Personnel Dosimetry and Dose Assessment**

- Exposure estimating procedures

- Potential intake occurrences

- Routine and non-routine bioassay program components

- Personnel dosimetry

- Internal dosimetry

- Nuclear accident dosimetry (NAD)

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### **Appendix B**

Sample analysis

Internal dose equivalent

Induced activity

Dose assessment

Dose calculation techniques

Measurements

Modeling techniques

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### **Appendix B**

#### **Knowledge Levels for the Performance of Radiation Protection Functions (continued)**

##### Record keeping and Reporting Requirements

- Records management
- Records storage
- Types and procedures for personnel dosimeters
- Trend analysis techniques
- Radiological work permit documentation
- Survey documentation for area monitoring
- Personnel monitoring documentation

##### Training requirements

- Visitor Orientation
- General Employee Radiological Training (GERT)
- Radiological Worker Training (RW I & II)
- Radiological Control Technician (RCT)
- Technical support personnel training
- Supervisory/management training

#### **Skills for the Performance of Radiation Protection Functions**

##### Communication Skills

- Technical writing
- Computer
- Making public presentations

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### **Appendix B**

#### **Analytical/Interpretive Skills**

- Program and procedure evaluation
- Accident investigation
- Root cause analysis
- Evaluating contractor performance
- Trending
- Interpreting codes and standards
- Evaluating training programs

#### **Skills for the Performance of Radiation Protection Functions (continued)**

#### **Project Management Skills**

- Planning and scheduling resources
- Inspection
- Negotiation

#### **Observation Skills**

- Surveillance
- Observation
- Investigative techniques

#### **Instrumentation and Monitoring**

- Use (calibration and maintenance) of instrumentation
- Radiological surveys and monitoring (radiation, airborne radioactivity)

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### **Appendix B**

#### Management Skills

- Team building

- Conflict resolution

- Interview techniques

- Communications

- Interpersonal relationships

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### **Appendix B**

#### **Sample Radiological Control Manager Detailed Position Description Format**

##### ***POSITION SPECIFICATION***

The specific position specification should include major duties, management responsibilities , and technical work responsibilities, and should address the following criteria for the Radiological Control Manager Position:

The Radiological Control Manager should be an experienced professional in radiological control and be familiar with the design features and operations of the facility that affect the potential for exposures of persons to radiation and/or radioactive material.

The Radiological Control Manager should have the technical competence and experience to establish radiological control programs and the supervisory capability to direct the implementation and maintenance of radiological control programs.

The Radiological Control Manager should have knowledge of Federal, State, and local regulations and requirements, and of national and international radiation protection standards and recommendations.

The Radiological Control Manager should have knowledge of techniques in the development of comprehensive radiation protection programs for an industrial/nuclear complex.

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### **Appendix B**

#### ***QUALIFICATION REQUIREMENTS***

##### **Education:**

Baccalaureate in science, health physics, or engineering.

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### Appendix B

#### Acceptable experience for the position:

Related experience	4 yr
which should include	
DOE radiological activities	3 yr
Supervisory or Management	1 yr
On-site	½ yr

#### Notes:

- (1) Certification by the American Board of Health Physics provides equivalency to the related experience and education required above.
- (2) Advanced academic degrees can count as related experience where course work related to radiological control is involved.

#### Special Requirements:

- (1) Management and supervisory skills described in section B, paragraph 1.2, of appendix A.
- (2) During the years of DOE radiological activities experience, the individual should have participated in supervision or management activities associated with DOE radiological activities at a DOE radiological facility for 3 months.
- (3) Management should provide persons assigned to, or being considered for, the position of Radiological Control Manager a structured program leading to certification by the American Board of Health Physics.



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### **Appendix B**

#### ***KNOWLEDGE, SKILLS, AND ABILITIES***

The following lists are the general knowledge, skills, and abilities that should be possessed by the Radiological Control Manager. These lists may be expanded to include the more detailed knowledge, skills, and abilities that are related to the functions of the Radiological Control Manager at their site.

#### **Knowledge Required for the Radiological Control Manager:**

- Radiological Protection Standards, Regulations, and Requirements

  - Non-radiological Standards, Regulations, and Requirements

  - Contamination Control

  - Instrumentation, Surveys, and Monitoring

  - Personnel Exposure Control

  - Personnel Dosimetry and Dose Assessment

  - Record Keeping and Reporting Requirements

  - Training Requirements

#### **Skills Required for the Radiological Control Manager:**

- Personnel Management Skills

- Communication Skills

- Analytical/Interpretive Skills

- Project Management Skills

- Observation Skills

- Instrumentation and Monitoring

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### **Appendix B**

#### **Abilities Required for the Radiological Control Manager:**

Develop and implement strategic and tactical plans for the administration of a complex radiological protection program.

Identify areas where policy direction is needed and then promulgate policy in all areas of radiological protection.

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**Appendix C**

## **Performance Measurement Guidelines**

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**Appendix C**

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### **Appendix C**

#### **Performance Measurement Guidelines**

Evaluation of individual performance in key radiation protection positions is critical to improving overall performance in Department of Energy radiation protection programs. Therefore, individual contributions toward meeting program performance objectives at a facility or site should be objectively evaluated. Each of the Department's radiological facilities monitors program effectiveness through a series of performance indicators. These are described in articles 131 and 133 of the *DOE Radiological Control Manual*. While the incumbent in a key radiation protection position may not have an influence on a particular performance indicator used at his site, the incumbent should work with management to identify appropriate performance expectations and appropriate measurement mechanisms for that position.

Once performance standards have been identified for a key radiation protection position, goals and objectives for individual performance may be cooperatively established between the incumbent and his supervisor on an annual basis. Goals and objectives should be challenging but achievable and must have a positive impact on the site's performance goals. Goals and objectives should be meaningful, measurable, and consistent with the site's mission and function. The goals and objectives that have been agreed on should be documented, with progress periodically reviewed throughout the review period (e.g., monthly performance reviews throughout the year). More frequent reviews will allow making adjustments necessary to achieve specified goals or adjusting goals where warranted.

The following lists provide information may be used to develop performance indicators or performance measurements.

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## **Appendix C**

### *DOE Radiological Control Manual*

*Table 1-1 Suggested Radiological Performance Indicators*

#### **Exposure control**

- a. Collective dose
- b. Average worker dose
- c. Maximum dose to a worker
- d. Number of unplanned exposures resulting in doses greater than the Administrative Control Level
- e. Number of dose assessments for lost or damaged dosimeters
- f. Maximum neutron dose to a worker

#### **Personnel contamination**

- a. Number of skin and personal clothing contaminations
- b. Number of contaminated wounds
- c. Number of facial contaminations

#### **Control of internal exposure**

- a. Number of positive bioassays
- b. Number of airborne events
- c. Number of alarms on airborne monitors (actual and false)
- d. Number of Airborne Radioactivity Areas
- e. Area of Airborne Radioactivity Areas in Square Feet

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### **Appendix C**

#### **Control of contaminated areas in operational areas**

- a. Number of Contamination and High Contamination Areas
- b. Area of Contamination Areas in Square Feet
- c. Area of High Contamination Areas in Square Feet
- d. Number of spills

#### **Minimization of radioactive waste**

- a. Volume and activity of radioactive waste in cubic feet and Curies, respectively
- b. Number of cubic feet not subject to volume reduction by incineration, compaction, or other means

#### **Control of radioactive discharges**

- a. Activity of liquid radioactivity discharges in Curies
- b. Activity of airborne radioactivity discharges in Curies

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**Appendix C**

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**CONCLUDING MATERIAL**

**Review Activity:**

DOE  
DP  
EH  
EM  
NE  
ER  
EM  
NE  
ER

Field Offices  
AL  
CH  
ID  
NV  
OAK  
OH  
OR  
RF  
RL  
SR

**Preparing Activity:**

DOE-EH-52

**Project Number:**

6910-0060